thermally non-uniform operation between basic HBTs is prevented, and deterioration of a high-frequency characteristic of the power amplifier is prevented.

Further, there is employed a heterojunction structure made of GaAs and AlGaAs. GaAs material has higher electron mobility than does Si, thereby embodying a faster bipolar transistor.

As a result of a driver stage being made of the same substrate as that of an output stage, there can be embodied a compact high-performance amplifier.

In the previous embodiment, the driver stage is embodied as a multi-finger HBT made up of basic HBTs of single emitter structure, and the output stage is embodied as a multi-finger HBT made up of basic HBTs of multi-emitter structure. However, the driver stage and the output stage are not necessarily limited to these structures. Depending on power gain, a front stage may be simply formed into a multi-finger HBT made of basic HBTs of single emitter structure, and a subsequent stage may be simply formed into a multi-finger HBT made of basic HBTs of multi-emitter structure.

Alternatively, a power amplifier may be constituted such that a driver stage and an output stage are formed into a multi-finger HBT made of basic HBTs of multi-emitter structure and such that the number of emitters of each basic HBT provided in the output stage is made greater than that of each basic HBT provided in the driver stage.

The high-frequency semiconductor device according to the present invention has the foregoing structure and yields the following advantages.

Specifically, the high-frequency semiconductor device comprises

- a first portion of an amplifier circuit which is embodied by means of connecting a plurality of first bipolar transistors in shunt with each other and is provided on a first semiconductor substrate, each of the first bipolar transistors having a heterojunction structure; and
- a second portion of the amplifier circuit which amplifies a signal output from the first portion, has a heterojunction structure, is formed by means of connecting a plurality of second bipolar transistors in shunt with each other, and is provided on a second semiconductor substrate, each of the second bipolar transistors having a larger number of emitter electrodes than do the first bipolar transistor. As a result, while an increase in the capacity of a p-n junction between the base layer and the collector layer of each of transistors provided in a front stage of an amplifier circuit is prevented, occurrence of nonuniform operations of transistors provided in a subsequent stage of an amplifier circuit having great output power can be prevented. By extension, there can be constituted a high-frequency semiconductor device which minimizes deterioration of a high-frequency characteristic and has high thermal reliability.

Preferably, the first portion of the amplifier circuit corresponds to a driver stage, and the second portion of the amplifier circuit corresponds to an output stage. As a result, while an increase in the capacity of a p-n junction between the base layer and the collector layer of each transistor provided in a driver stage of an amplifier circuit is prevented, occurrence of nonuniform operations of transistors provided in an output stage of an amplifier circuit having the highest output power can be prevented. By extension, there can be constituted a high-frequency semiconductor device which minimizes deterioration of a high-frequency characteristic and has effectively-enhanced thermal reliability.

Preferably, the emitter layer of the bipolar transistor is formed from AlGaAs, and the base layer is formed from GaAS. Hence, the bipolar transistor enables high-speed operation. Consequently, there can be constituted a high-frequency semiconductor device having superior high-speed performance and high thermal reliability.

Preferably, the first semiconductor and the second semiconductor are integrally formed into a single piece. Therefore, the amplifier circuit can be made compact. In turn, there can be constituted a compact high-frequency semiconductor device.

While the presently preferred embodiments of the present invention have been shown and described. It is to be understood these disclosures are for the purpose of illustration and that various changes and modifications may be made without departing from the scope of the invention as set forth in the appended claims.

The entire disclosure of a Japanese Patent Application No. 2000-261329, filed on Aug. 30, 2000 including specification, claims, drawings and summary, on which the Convention priority of the present application is based, are incorporated herein by reference in its entirety.

What is claimed is:

1. A high-frequency semiconductor device comprising:

first and second semiconductor substrates;

an amplifier circuit including

a driver amplifier comprising a plurality of first heterojunction bipolar transistors, each first heterojunction bipolar transistor having a respective emitter electrode, base electrode, and collector electrode, the first heterojunction bipolar transistors being connected in shunt with each other and located on the first semiconductor substrate; and

an output amplifier amplifying a signal output from the collector electrodes of the driver amplifier, the output amplifier of the amplifier circuit including a plurality of second heterojunction bipolar transistors connected in shunt with each other, each second heterojunction bipolar transistor having a respective collector electrode, a respective base electrode, and a plurality of emitter electrodes, wherein the base electrode is connected to the collector electrodes of the first heterojunction bipolar transistors, the emitter electrodes are grounded, and the output amplifier is located on the second semiconductor substrate.

2. The high-frequency semiconductor device according to claim **1**, wherein each of the first and second heterojunction bipolar transistors includes an emitter layer of AlGaAs and a base layer of GaAs.

3. The high-frequency semiconductor device according to claim **1**, wherein the first semiconductor substrate and the second semiconductor substrate are a single semiconductor substrate.

4. The high-frequency semiconductor device according to claim **2**, wherein the first semiconductor substrate and the second semiconductor substrate are a single semiconductor substrate.

5. The high-frequency semiconductor device according to claim **1**, wherein the first semiconductor substrate and the second semiconductor substrate are separate semiconductor substrates.

6. The high-frequency semiconductor device according to claim **2**, wherein the first semiconductor substrate and the second semiconductor substrate are separate semiconductor substrates.

7. The high-frequency semiconductor device of claim **1**, wherein each of the second heterojunction bipolar transistors